THE ROLE OF KNOWLEDGE MANAGEMENT IN ENHANCING KNOWLEDGE PULL IN THE CONSTRUCTION ORGANISATION TO DELIVER INNOVATION: A CASE STUDY

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Knowledge pull has become an essential requirement for construction organisations to survive in knowledge era. As more industries recognizing knowledge as a vital sustainable asset, the construction industry cannot afford to lag behind. This paper argues that implementing knowledge management principles in the organisation would generate forces within the organisation enabling the pull of knowledge from outside the organisation to within and exploit it to deliver innovation. This would pave the way for external sources of knowledge and innovation, like universities or research centres, to work closely with the industry and would ensure that useful and beneficial academic research would not go unnoticed. The paper provides an account of a case where a specific construction organisation has benefited from the effort of an employee who constantly strived to establish a link with the external innovative knowledge by attending research conferences. As a result external knowledge of an innovative product was introduced into the organisation and used on a construction project to deliver significant benefits that resulted in enhanced profitability. Soft System Methodology (SSM) has been used to undertake this case study and to develop deeper understanding of the issues involved. The paper argues that such beneficial links with the external research and knowledge bodies must be better understood and encouraged, and knowledge management provides the organisation with the tools and techniques to achieve this.

Keywords: Knowledge Management, Innovation, Research, Soft Systems Methodology.

INTRODUCTION

The adoption and diffusion of various innovations that have the potential of increasing the productivity of construction industry often finds that it is very hard to make inroads in the construction industry (Maqsood et al, 2003). The community in the construction industry (i.-e, research community or the organisations working for developing innovative products or processes) has difficulty pushing this knowledge into organisations. Their efforts are met with strong resistance predominantly due to resistance to change, stiff culture, lack of motivation, weak leadership in strategy and vision, absence of learning mechanisms, and failure to appreciate the immediate

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benefits of adopting innovations (Gann, 2001, Santos et al., 2002; Oglesby, 1989; Bresnen and Marshall, 2001). This leads to a gap between research and its practical implications.

As the construction industry takes on the challenge to change or modernize in this new millennium and knowledge era, to be at par with other competing industries while contributing to national GDP, knowledge management is becoming a driving force. It is playing a pivotal role in achieving this long-desired transformation- a dream that academic/research community has long vied for. Success of knowledge management initiatives in other industries - mainly pharmaceuticals, electronics, and manufacturing – has gained the attention of construction organisations. The increased chance of success of adopting and diffusing knowledge management principles is acting as an impetus for academic researchers to develop best practice knowledge management for construction organisations. This is evident from the increasing number of publications and conferences on the topic of knowledge management in the construction industry.

Knowledge management allows organisations to devise mechanisms that will bring them closer to the communities generating new knowledge and producing innovations. Instead of that community pushing the knowledge into the organisations, an organisation will be able to pull the knowledge and effectively use it. This research study presents a case where an Australian construction company has benefited enormously by being able to pull knowledge of a specific innovation from an external source. It happened predominantly through the effort of one employee, and his dedication to keep in touch with new knowledge in his area of practice. The study argues that knowledge management implementation in the organisation will formalize this process and make such events happen regularly as a part of the organisational process. The research has been conducted as a part of a doctoral study that is investigating the role of knowledge management in supporting innovation in the construction process.

UNDERSTANDING KNOWLEDGE MANAGEMENT

Knowledge is being recognised as a vital resource and a source of competitive advantage in today's dynamic and changing business environment (Burton-Jones, 1999). The role of effective management of knowledge is producing innovation, reducing project time, improving quality, and customer satisfaction (Kamara *et al*., 2002; Love *et al.*, 2003). Through the process of knowledge management, the exploitation of an organisation's intangible assets creates value and knowledge both internally and externally (Liebowitz and Megbolugbe, 2003; Davenport and Prusak, 2000; Snowden, 1999). In the project environment, knowledge management will assist project managers to improve communications within the teams. It will also provide informed knowledge to the project manager and project teams. Knowledge management can ensure better sharing of best practice documents, lessons learnt, project management and system engineering methodologies, and review and document the rationale for strategic decision-making (Liebowitz and Megbolugbe, 2003). The failure to capture and transfer project knowledge leads to the increased risk of 'reinventing the wheel', wasted activity, and impaired project performance (Siemieniuch and Sinclair, 1999). These potentials and benefits of knowledge management are convincing enough for the construction organisations to venture into adopting its principles

Research in knowledge management has gained tremendous pace since its inception in the last decade. This is evident in the large amount of literature and the further growth

in the area of knowledge management. Furthermore, researchers and academics continue to explicate a realistic knowledge management philosophy that can be readily put into actual practice and implemented with success. This has resulted in a shift in knowledge management from being more technology dependent in the mid 1990's to a lesser technological dependence and higher emphasis on socialisation in late 1990's and early 2000's. Soft factors like culture, leadership, vision etc are becoming more important to the philosophical fundamentals of knowledge management. According to Davenport and Prusak (2000), knowledge management is substantially a human interaction exercise with information and communication technologies (ICT) providing a supportive and facilitative role. Indeed the ratio of 1/3rd technology to 2/3rd people-related issues has been accepted as a useful guideline.

A SOCIALLY CONSTRUCTED MODEL OF KNOWLEDGE MANAGEMENT

Recent research in knowledge management has seen the variety of knowledge management models put forward by researchers to elicit their conceptualisation of knowledge management. Consistent with a focus on human interaction and the importance of people-related issues, this study concentrates upon a socially constructed model of knowledge management.

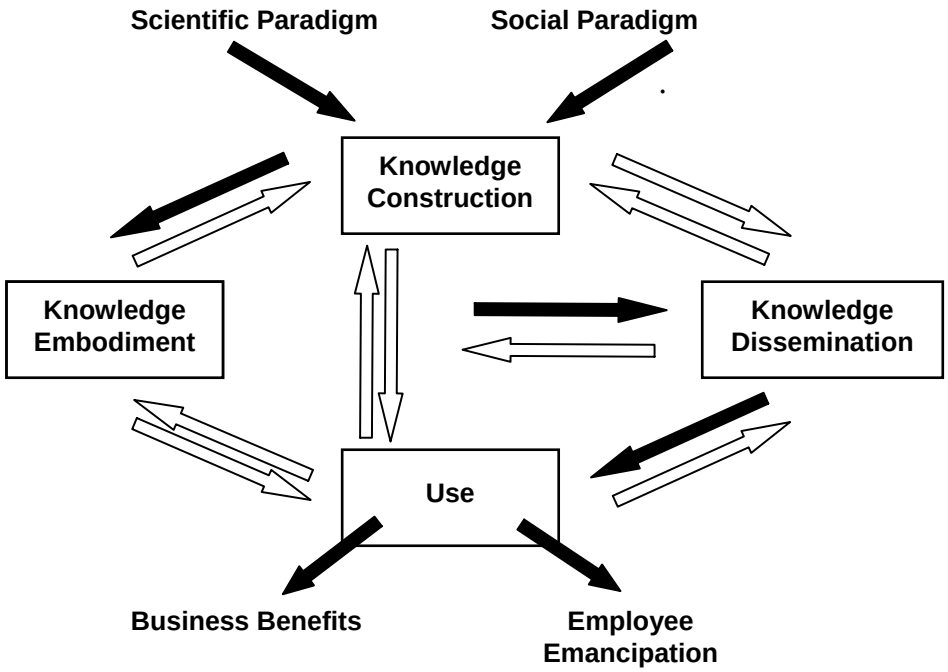

Figure 1: Socially Constructed Knowledge management model.
(Source: Modified from Demerest, 1997 by McAdam and McCreedy, 1999)

Such models are intrinsically linked to the social and learning process within the organisation. A socially constructed model modified by McAdam and McCreedy (1999) from Demerest's (1997) adaptation of Clark and Staunton's (1989) model of knowledge management is shown in Figure 1.

The model gives a balanced approach between the scientific and social approaches to knowledge management. The 'uses/benefits' of knowledge management are viewed as both emancipatory and as business oriented. Knowledge flows are seen as highly recursive rather than as sequential and mechanistic. According to McAdam and

McCreedy (1999) this model allows knowledge management to be associated with the emerging social paradigm while at the same time contributing to the current scientific paradigm

In the case study, conferences are the events illustrated by this model. The participants are able to construct their personal knowledge through scientific knowledge being disseminated in the conference and at the same time provide them with an excellent opportunity to further enhance the knowledge being gained through socialisation with other experts and knowledge carriers attending the conference.

SOFT SYSTEMS METHODOLOGY (SSM) – A USEFUL TOOL FOR SENSEMAKING

The traditional systems approach – hard systems thinking - is based on the reductionist technique in which problems are solved by reduction and analysis of the component parts. This technique is appropriate in complex and highly structured situations that can be well defined, particularly in terms of inputs and outputs.

On the other hand, complex systems – especially those made up of human, technological, and organisational components - often have emergent properties that are not easily identified in the component parts. In these situations, the alternative of soft systems thinking – thinking about the whole situation, and considering what is both desirable and feasible – is recommended as an additional tool for sense-making and problem solving [Maqsood, Finegan and Walker (2003)]. As illustrated in Figure 2, soft systems thinking overlaps and extends the problem solving process – it does not occupy the same problem solving domain as hard systems thinking.

The systems thinking approach has been formalized in Soft Systems Methodology (SSM), where the concepts are based on practical application and experience in a wide variety of complex managerial systems. The methodology is designed to allow the human element of such systems, which is typically unstructured and poorly defined, to be incorporated into problem solving work. It may be used to analyze any problem or situation, but it is most appropriate where the problem “cannot be formulated as a search for an efficient means of achieving a defined end; a problem in which ends, goals, purposes are themselves problematic” [Checkland (1999, p.316)].

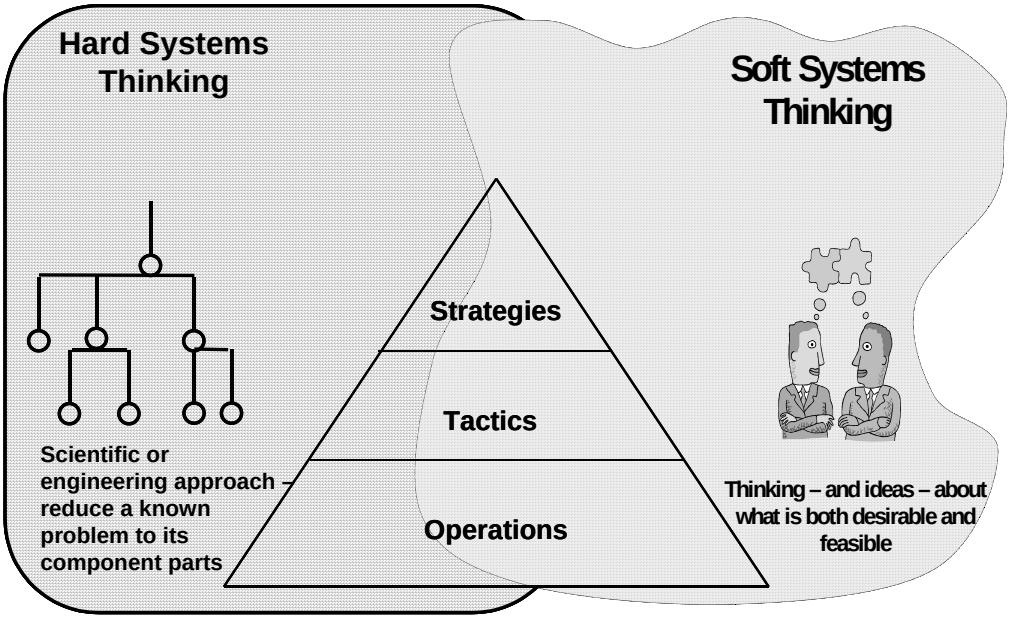

Figure 2: Hard Systems Thinking versus Soft Systems Thinking

SSM in its idealised form is described as a logical sequence of seven steps [Checkland (1999, pp. 162-183)]. These are:

Stages 1 and 2 - Expression of the problem and formulation of the Rich Picture.

Stage 3 - Selection of a Root Definition.

Stage 4 - Model Building - the Conceptual Model.

Stage 5 – Comparison.

Stage 6 and 7 - Recommendations for Change, and Taking Action.

In the practical sense, these stages are activities that can be undertaken in any order, and with considerable iteration. In many cases, back-tracking and reworking are essential parts of SSM.

A number of studies [Elliman and Orange (2000), Green (1999), Cushman *et al.* (2002), and Venters *et al.* (2002)] have suggested ways that SSM can be used as a tool for knowledge management in the construction industry.

The Rich Picture, the major work of stage two can be used to understand the organisational context and culture, stimulate debate and capture the vision for the future, and identify the stakeholders and actors. The Root Definition (Stage 3) can be used to identify responsible actors, key transformations, and important knowledge resources. The conceptual models, which can be both summary and detailed, can be used to identify patterns in knowledge activities.

INNOVATION ADOPTION AND DIFFUSION CASE STUDY

The case study describes the adoption and diffusion process of an innovative product called “Bamtec” in a construction company (Visit http://www.bamtec.co.uk/startuk.html?index.html~main accessed 5 May, 2005). The technical nature of the product is immaterial to the understanding of this case study.

The most important issue is to know that the process behind the acceptance of such an innovation in the organisation to appreciate how it was adopted and diffused. Issues like adoption of innovation and its diffusion are central to the core of knowledge management. Knowledge management helps in identifying innovations that have the potential to improve the productivity. It then provides a framework to adopt and diffuse that innovation throughout the organisation in order to reap the benefits from that innovation.

The Rich Picture in Figure 3 provides a pictorial representation of the related situation. The innovative product under study was displayed at a European construction conference. This conference was attended by one of the design managers from the organisation under study. The rich picture documents the values and beliefs usually existing in the organisation. For some, attending conferences is not important, but others see it as a serious opportunity and expectation their organisation to allow them attend such events on a regular basis. In this case, design manager implemented the use of the BAMTEC product in a project that previously had been declared a "dead duck". It was a project that was running over budget and not returning any profit to the company. Implementing the BAMTEC product on the project - in the words of the design managers - "literally" saved the project and pushed it towards a profitable outcome. Knowledge Management can potential help make these events happen on regular basis. The root definition and conceptual model shown in Figure 4 and 5 provide an explicit description of how a specific innovation can be adopted and diffused and can be effectively utilized for the benefit of the organisation. This is in accordance with SSM stages 1-4.

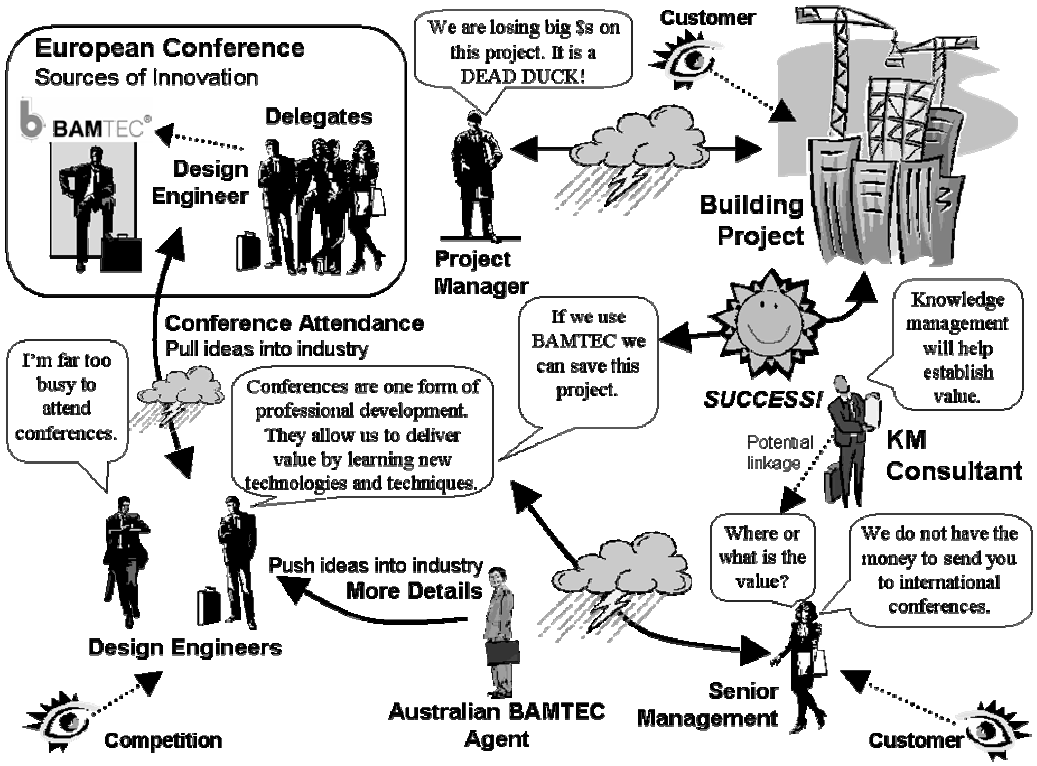

Figure 3: Rich Picture of the BAMTEC Study

ROOT DEFINITION – BAMTEC	**Customer:** The building company,

A system owned by the Design Engineers, who with the support of Senior Management are able to achieve professional development and learn new ideas and techniques by attending major, international conferences. This adoption of innovative building techniques can be the key to project success. However, Senior Management need to be convinced of the value of conference attendance, and many design engineers consider themselves to be too busy to attend conferences.	project managers, the clients and the community. **Actors:** Design engineer, senior management. **Transformation:** To achieve professional development and learn new ideas and techniques by attending major, international conferences. **Weltanschauung (why Bother?):** This adoption of innovative building techniques can be the key to project success. **Owner:** Design engineer **Environment:** Work pressure, cost and time critical, and community expectations.

Figure 4: Root Definition and CATWOE of the BAMTEC study.

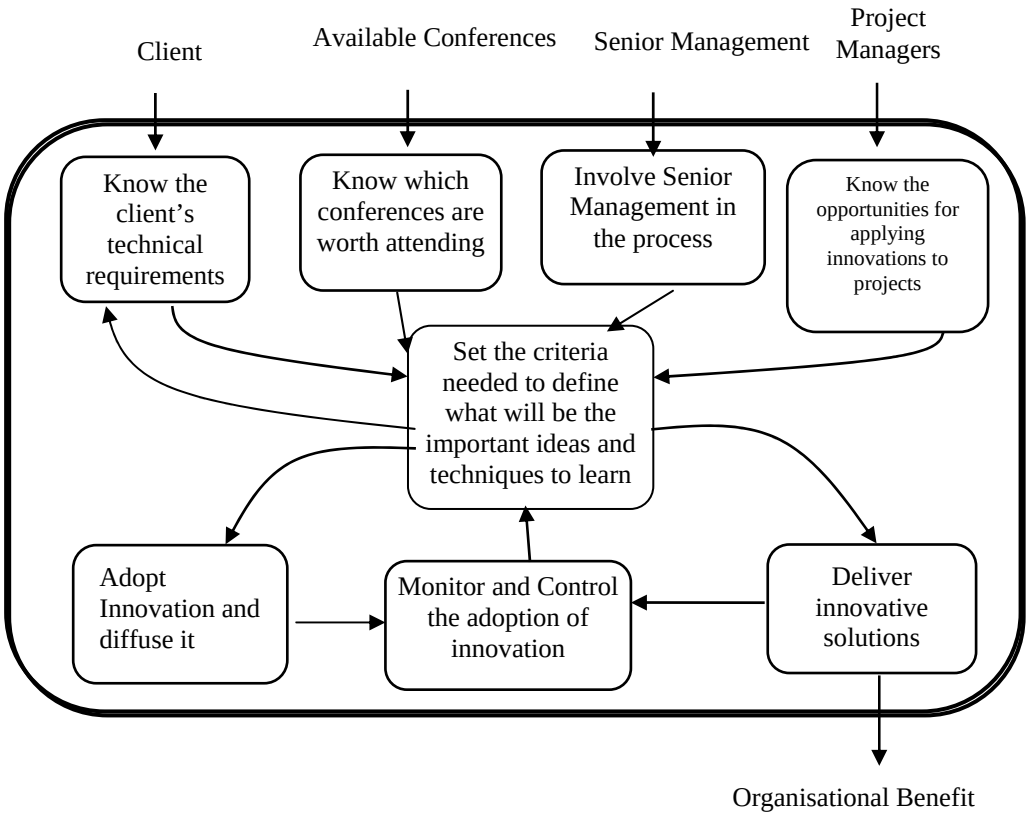

Figure 5: Conceptual Model of the BAMTEC study.

In the next stages (Stage 5&6) of the research, participants were interviewed with the structured questions that have emerged from the key activities described in the

conceptual model. For each activity highlighted in the conceptual model, participants were asked the following questions:

- Do you undertake the described activity?
- How is this activity accomplished?
- Define your measure of performance for undertaking this activity.
- Describe any improvements that could be made to the way this activity is undertaken.
- How are you likely to undertake this activity in the future?
- Do you think this is an important activity?

This information forms the basis of the comparison between the realities of the real world and the "ideal" expressed by the conceptual model. This comparison – or gap analysis – provides the framework to focus on the issues and opportunities, examine assumptions, and better understand the dysfunctional behaviours/actions that need to be remedied. Stage 6 strives to identify the desirable and feasible options for change and improvement in the process regarding pulling external knowledge in the organisation. Based on the insights gained from the previous stages it is possible to assemble various options for improving the pull of knowledge from external sources. These can be summarised as follows:

1. Involve senior management and make them aware of the benefits that external knowledge may bring to the organisation in order to get extra budget for conferences.
2. Select a framework to decide what are important ideas and techniques to learn from clients' point of view, and also from organisations point view, matching with the overall organisation's strategy and vision.
3. Identify the conferences or other external events that will disseminate knowledge considered helpful for the organisation.
4. Ask project managers to report on innovation opportunities that they may be able to pinpoint while executing particular projects.
5. Devise selection criteria to identify the employees who will benefit – and deliver benefits - if they are sent to attend conferences.
6. Arrange a seminar or socialising event where an employee returned from a conference with new knowledge will be able to share and transfer it to other employees in the organisation.

Stage 7, which is the last stage of SSM requires the identified changes and action in Stage 6 to be implemented. The actions taken will create new situations, from which may emerge a new set of problems. This can lead to further iterations of SSM and analyst must be prepared to continue this learning cycle. In this study, the participants agreed to the set of actions listed above in order to improve the process of organisational learning. However, the change required in the organisation demands a thorough culture change. The organisation will undergo this change when it embraces a knowledge management philosophy as a whole. The organisation under study is considering facing this challenge of changing its culture. There is no research data to-

date available for reporting on Stage 7 of this SSM cycle for this case. However; as soon as it becomes available, it will be reported upon.

CONCLUSIONS

The paper has highlighted a case where an organisation has pulled knowledge of an innovative from an external source and used it on a project to deliver significant benefits. Furthermore, this organisation has now made this innovation a routine part of their work. This adoption process came about when an employee attended a conference where the innovative product "Bamtec" was on display. He liked the idea and used that innovation on a project that was overrunning its budget. As a result this project was turned into a profitable venture. This study argues that knowledge management implementation in an organisation can help such events to happen regularly, thereby making use of the external knowledge to the benefit of the organisation.

The use of SSM in carrying out this case study made it possible to understand the organisational issues in rich detail. The set of six actions identified using SSM have the potential to bring about change in the organisation's strategy for external knowledge procurement. These six actions are particularly relevant to the organisation under study, as SSM seeks to develop a relevant system. However, other organisations may find the discussion and analysis useful.

Knowledge management strives to develop the thrust and pull within organisations by creating a strong demand for new knowledge. If this phenomenon becomes a routine, the research community will be better aligned with the construction industry. It will not have to struggle to push the knowledge into the organisations. Instead, the organisations itself will be demanding the development of innovative and productive products, tools and techniques. This will be reflected by the decreasing gap between research and its practical application in the construction industry.

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